



Identification of the installation/facility:

Country: UK
 Location (city): Bedford
 Name of the facility: Transonic Wind Tunnel
 Date of construction or of acquisition or of main refurbishment: 1990
 Owner: Aircraft Research Association Limited
 Contact point: +44 (0)1234 350681
 Internet site: www.ara.co.uk

Technical characteristics:

1 - Type of infrastructure

- | | |
|--|-------------------------------------|
| Wind tunnel | <input checked="" type="checkbox"/> |
| Propulsion bench | <input type="checkbox"/> |
| Structures facility | <input type="checkbox"/> |
| Material facility | <input type="checkbox"/> |
| Simulator (ex. Flight simulator, tower, ...) | <input type="checkbox"/> |
| Flight test bed (aircraft, embedded facilities, ...) | <input type="checkbox"/> |
| Supercomputers | <input type="checkbox"/> |
| Other | <input type="checkbox"/> |

2 - Main technical characteristics

The ARA Transonic Wind Tunnel (TWT) is a closed-circuit, continuous wind tunnel. The perforated walls with 22% open area ratio allows testing throughout the transonic speed range. The main technical characteristics are as follows;

Maximum speed: $M = 1.4$

Mach number variation, local variations about the mean value:

- Low subsonic (fan only) $\Delta M < \pm 0.0005$
- High subsonic (plenum suction) $\Delta M < \pm 0.001$
- Low supersonic (plenum suction) $\Delta M < \pm 0.005$

Broad band noise level across Mach range:

- RMS $C_p < 0.5\%$

Turbulence levels at subsonic speed:

- $u'/U < 0.1\%$ $v'/U < 0.2\%$

Test section: 2.74 metres wide x 2.44 metres high

Stagnation pressure: 0.8 to 1.2 atmospheres

Reynolds number: Typically 13 million/metre at $M = 0.8$ (1 bar stagnation pressure)

Maximum Reynolds number: 17 million/metre

Operating temperature: Typically 290K to 320K

Incidence angle range: -10° to $+40^\circ$ which can be offset by using suitably cranked support systems (up to 90°)

Roll angle range: $\pm 180^\circ$



3 - Research domains which can be addressed (refer to ACARE taxonomy <http://www.acare4europe.com/docs/ASD-Annex-final-211004-out-asd.pdf>)

Flight Physics

- Computational Fluid Dynamics
- Unsteady aerodynamics
- Aeronautical propulsion integration
- Airflow control
- High lift devices
- Wing design
- Computational acoustics
- External noise prediction

Aerostructures

- Acoustic measurements and test technology

Propulsion

- Performance
- Air-breathing propulsion
- Computational methods

Innovative Concepts and Scenarios

- Unconventional configurations and new aircraft concepts

4 - Main (or specific) associated measurement techniques

Drag testing

Stability and control testing

Propulsion installation testing

Isolated propeller testing

Installed propeller testing

Aero-acoustic measurements with tunnel acoustic liner

- Overall aircraft forces and moments

- Component forces and moments

- Steady-state and dynamic pressure measurement

- Pressure sensitive paint testing

- Thrust and mass flow measurement for propulsion testing

5 - Operational status

- Fully operational



6 - Pictures:



Aerial View of the ARA Transonic Wind Tunnel



Airbus A380 Model in the ARA Transonic Wind Tunnel



Financial elements:

Replacement cost (M€uros)

Less than 10

10 to 30

30 to 60

60 to 100

More than 100

Practices concerning:

Access policy - Contract

Support - None

Comments:

Origin of information ('signature'): author and date